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THE FURROW

CORN BELT EDITION/MARCH-APRIL 1985



THE NEW FARMHANDS

SUPER CORN YIELDS
LESS STRESS FOR SOYBEANS

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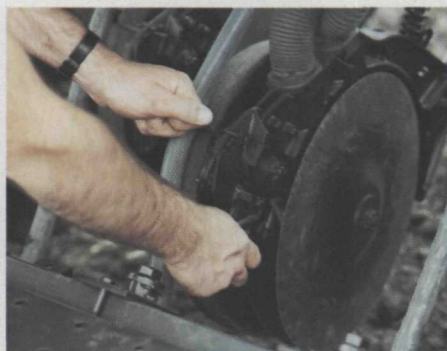
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THE FURROW

MARCH-APRIL 1985 • VOL. 90, ISSUE 2

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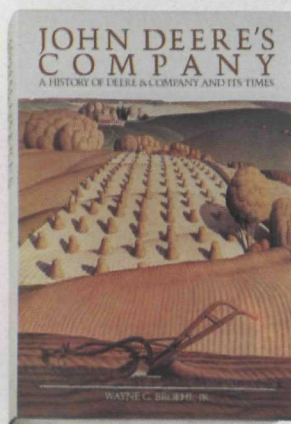
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"... FOR WHAT AVAIL THE PLOW OR SAIL, OR LAND OR LIFE, IF FREEDOM FAIL?"
—RALPH WALDO EMERSON



This issue's cover: A fanciful look into the future shows how some might envision the impact of robotics on agriculture. Our cover story, starting on page 10, provides a more realistic view of developments in farm automation. Photo by Larry Volbruck.



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*Rankings are based on official tests conducted at the University of Nebraska Test Center. For a free copy of Nebraska Test No. 1437 (1250), 1505 (1450) or 1506 (1650), send a self-addressed envelope to Deere & Company, Dept. 870, John Deere Road, Moline, IL 61265.



In the 35- to 45-hp range, no other tractor offers the 1250's combination of fuel efficiency and lugging ability.



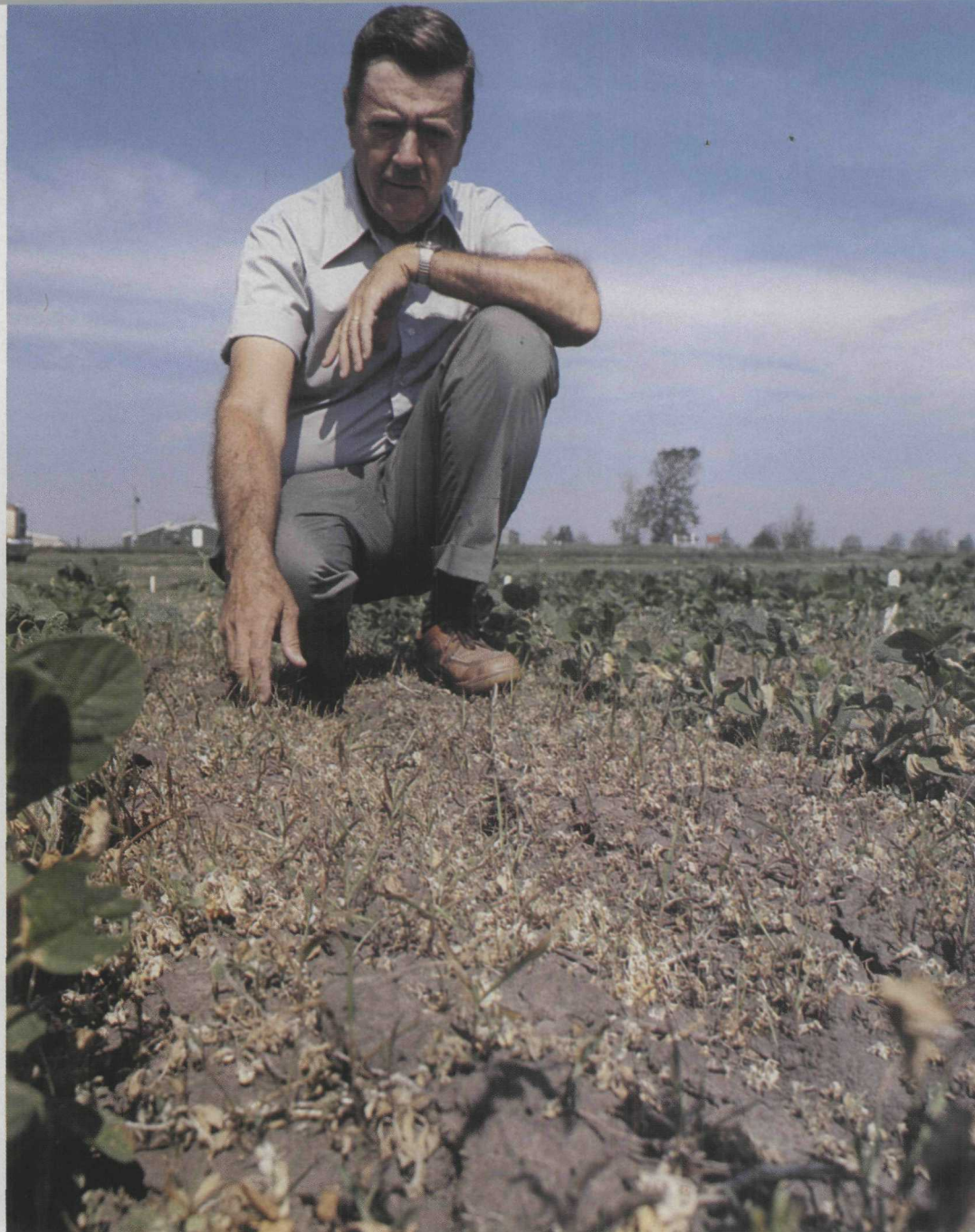
The 50-hp 1450 is an ideal field tractor. In its class this tractor ranked number one in fuel economy and lugging ability.



EFFICIENCY
EXPERTS



Fred Slife is trying to find the best way to control broadleaves and grasses without burning beans.



SOYBEANS: Cutting chemical stress

*Here's how to get the full benefits from chemicals
without hurting the crop*

By Rex Gogerty

Soybeans are now subject to a wide array of chemical treatments, and all of them have the potential to put more beans in the bin. But herbicides and certain other chemicals can also hurt the crop more than they help.

Oops factor. One of the most common causes of herbicide damage to soybeans is failure to follow the rules. Proper mixing, calibration and application sound like basic stuff. But failure to clean equipment, ignoring wind drift, and simply not reading the label thoroughly result in millions of dollars in crop damage annually, according to Fred Slife, a University of Illinois weed scientist. Having to deal with a new crop of chemicals every year complicates the problem.

Slife says rotating herbicides is one way to reduce chances of crop damage. That's because families of chemicals react differently to soil moisture, soil type, temperature and other environmental factors. And a chemical rotation that includes postemergence herbicides reduces the risk of chemical carryover. Slife points out that most postemergence herbicides self-destruct when they come in contact with the soil, so there's no residue.

As part of his research, Slife is attempting to determine which postemergence treatment method is toughest on weeds and best for beans. For most-effective overall control of broadleaf weeds and grasses, he recommends separate applications of postemergence herbicides. He says tank mixes are sometimes less effective because grasses and broadleaves don't always reach the optimum treatment stage at the same time.

Tank-mixing certain postemergence herbicides can also result in a phenomenon called antagonism, further reducing the chemicals' effectiveness.

According to Slife, tank-mixing postemergence herbicides doesn't cause more bean leaf burning than using separate applications. In either case, he says, most herbicide damage can be avoided by zeroing in on exact amounts and applying when environmental conditions and stage of growth are optimum.

Preplant incorporated herbicides can cause serious leaf burning on soybean seedlings. This damage is referred to as brown-bean syndrome or "re-fried" beans. A classic example is seedling damage resulting from application of a metribuzin herbicide on soybeans following corn that was treated with atrazine. A solution is to plant varieties that tolerate metribuzin.

Good yielders. Using one of these tolerant varieties, Harley Ariens of Morrison, Ill., topped the Illinois 5-acre soybean yield contest a few years ago with a yield of 69.09 bushels per acre. He planted Dairyland DSR207 after incorporating a tank mix containing one quart of Treflan and one pint of Sencor per acre, plus a spray adjuvant. He incorporated twice. He says there was no visible herbicide damage.

"I'd been seeing scattered chemical injury in soybeans for several years, so I decided to look for a new variety rather than another herbicide," Ariens adds. "This is heavy soil, and it has quite a weed-seed population from flooding a few years back. Sencor has been pretty dependable year after year."

Last year, as a test, Ariens planted one susceptible variety in Sencor-treated soil. He reports that up to 40 percent of seedlings died where the susceptible variety was planted.

Ariens applies calcium to the soil as required. He also applies fertilizer in the row at planting. It's a solution that supplies 12 pounds of 11-28-18 per acre. He



Cecil Nickell is developing soybean varieties (left) with dual tolerance to disease and chemicals.

follows up with a foliar application of 28-16-7. To minimize leaf burn and get uniform coverage, he uses 100-micron controlled-droplet applicators. "I wait until just a few blossoms appear, then apply the fertilizer in the cool of the evening," he says.

Salt injury to soybean seed from fertilizer is also a potential source of stress. You can guard against this by placing starter applications at least 2 inches to the side of soybean seed, according to Cecil Nickell, a University of Illinois soybean breeder.

Nickell is screening for soybean varieties with tolerance to disease as well as chemicals. He says Altona and Tracy are sensitive to metribuzin, but they both carry genes for resistance to several races of phytophthora rot. "We are using these two as parents in combination with breeding lines that tolerate metribuzin but are susceptible to phytophthora rot," he says. "Our goal is to develop a soybean variety that is resistant to phytophthora rot and tolerant of metribuzin."

Another potential source



"Goof" plots demonstrate the season-long cost of not cleaning a sprayer thoroughly before treating beans.

of stress is the interaction of certain insecticides and herbicides, according to Ron Hammond, an entomologist at the Ohio Agricultural Research and Development Center. Hammond has studied the interaction of organophosphate insecticides and metribuzin. In his tests he applied an organophosphate with a planter in a 7-inch-wide band. He applied the label rate of metribuzin the next day. Of three soybean varieties in the tests, one was highly susceptible and yielded much less because of the insecticide-herbicide interaction. "We usu-

ally recommend that farmers wait until the insect problem appears, then apply a foliar insecticide," Hammond says. "But if a farmer elects to use a soil-applied insecticide, we recommend using metribuzin-tolerant soybean varieties and a carbamate rather than organophosphate insecticide."

Many soybean-breeding programs are geared to developing varieties with greater chemical tolerance. Meanwhile, some seed firms are attaching warning tags to bags containing susceptible varieties. Your ag-chemical suppliers may also be able to help you select the best variety for your chemical environment.

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Its refinements show

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Wide-spaced dual wheels provide nearly 25 percent more flotation than standard 30.5-32 tires.



at the end of the day.

downhill side of the combine is captured and rerouted through the Titan II's tailings return system. You'll harvest more of your crop—and you'll work at faster ground speeds.

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alignment, the standard-equipment dump-type stone trap, and much, much more. Your John Deere dealer can explain them all.

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Cleaning shoe is 11 percent larger to provide more grain-handling area.

Lift-out chaffer sections let you capture grain that builds up on the downhill side of the combine.

Cleaning shoe shakes 20 percent faster for more aggressive, more efficient grain cleaning.

COULD YOUR NEXT HIRED HAND BE A ROBOT?

A new generation of 'smart' machines is taking over many chores and making farms easier to manage

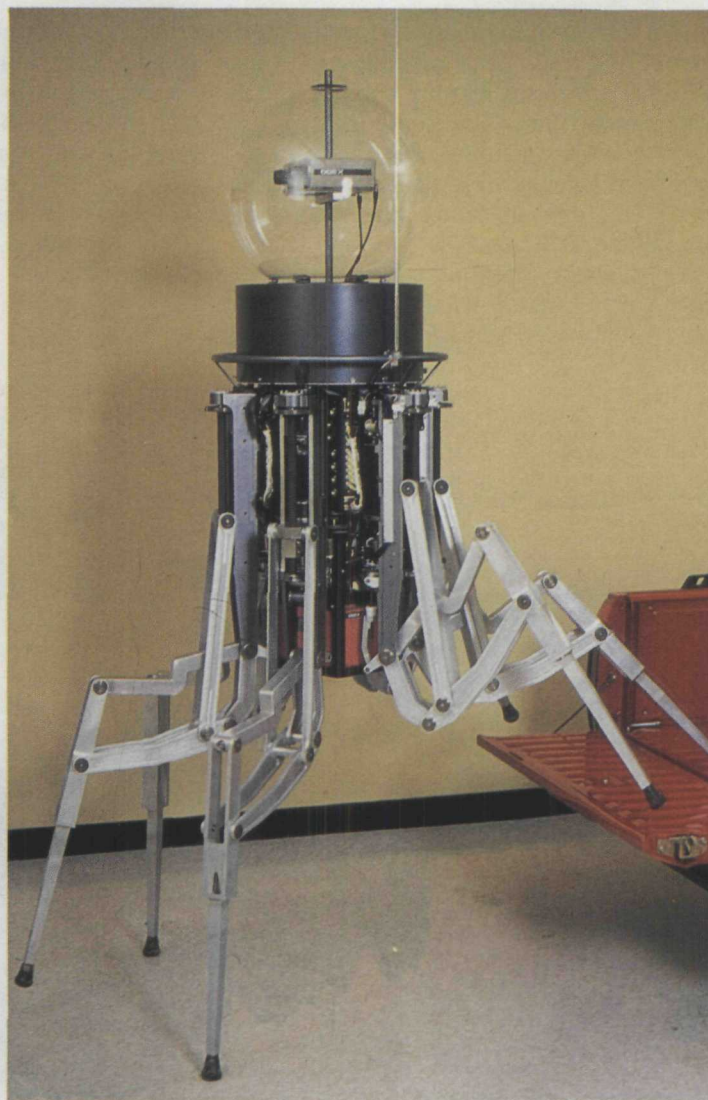
Welcome to a new era of farm automation. Thanks largely to recent developments in electronics technology, mechanical devices that operate automatically are reaching new levels of sophistication. These new farmhands are replacing muscle power, and they're also reducing the need for human observation and decision-making.

Some of these "smart" machines are new-generation robots that operate in surprisingly human-like ways. In other cases, engineers are using computer technology to automate mechanical devices that farmers have been using for years.

Farmers are already enjoying the fruits of recent automation research and development. Some, for example, are using traveling sprinklers that sense soil moisture and apply water accordingly. Others have installed new automatic systems for aerating grain. And many livestock producers are using automated feed-handling systems of one kind or another.

Other automated devices are still at the experimental stage. One example is a sheep-shearing robot under development in Australia. Its mechanical parts were derived from relatively simple, assembly-line robots. But Australian engineers say its electronic brain is much more complex.

"Since sheep don't come in a standard size or shape, our sheep-shearing robot requires a computerized electronic controller that is hundreds of times more sophisticated than the controller on the average assembly-line robot," says R.A. Leslie, a University of Western Australia agricultural engineer. "Our robot also has a much more sophisticated and sensitive sensor system, which keeps the



clippers a safe height above the sheep's skin."

It does take a human worker to catch a sheep and cinch its head and legs into retainers on the robot's cradle. (Leslie says sheep will remain motionless on the cradle for as long as necessary.)

Then the robot takes over. First it makes a few bold strokes to sense the sheep's overall skin landscape. Then it turns on its clippers and begins to make shearing strokes. The computer

The world's first functionoid, ODEX I, can lift 2,000 pounds. It can also step into a pickup truck's cargo bed.

controller interprets the robot's first shearing strokes to determine follow-up motions that will increase shearing speed and efficiency. The machine "learns" quickly and then plans ahead. Leslie says it can shear a sheep a bit faster than a human. But it can't shear the 5 percent of a sheep that's most difficult to shear—the face and crotch.

A commercial version of the

robot that would be economically feasible on a 4,000-head sheep operation may be available by the end of the decade, according to the Australian Wool Corporation, which provides funding for this and most of Australia's other wool-harvesting research.

Functionoids. Further into the future, farmers could be using robots programmed to do a variety of complex tasks. Such robots are called functionoids. One prospective manufacturer, Odetics, Inc., Anaheim, Calif., has already built a technology demonstrator called ODEX I. (See accompanying photo.) Tom Bartholet, the company's director for strategic planning, says it can lift 2,000 pounds, roughly five times its own weight. That's an unprecedented strength-to-weight ratio for a mobile robot, he adds. ODEX I is battery powered and will run continuously for an hour before it requires recharging.

ODEX I can stand on three of its six leg-like articulators. To walk, it extends three articulators at a time to form a series of tripods in succession. Bartholet says that ODEX I can walk about as fast as a man, and negotiate fairly rugged terrain.

Similar articulators could be added to do work. Bartholet says, for example, that a farm-going functionoid might be programmed and equipped to transfer tomato seedlings from greenhouse trays to the field. Then it could be reprogrammed to train vines onto stakes. It could also install irrigation lines or be programmed to select only ripe fruit. You could send it through the same field each day or two until the harvest was completed.

A successor to ODEX I may look entirely different when it

This prototype robot shears sheep a bit faster than a human, and nicks skin less often.

By Steve McGill

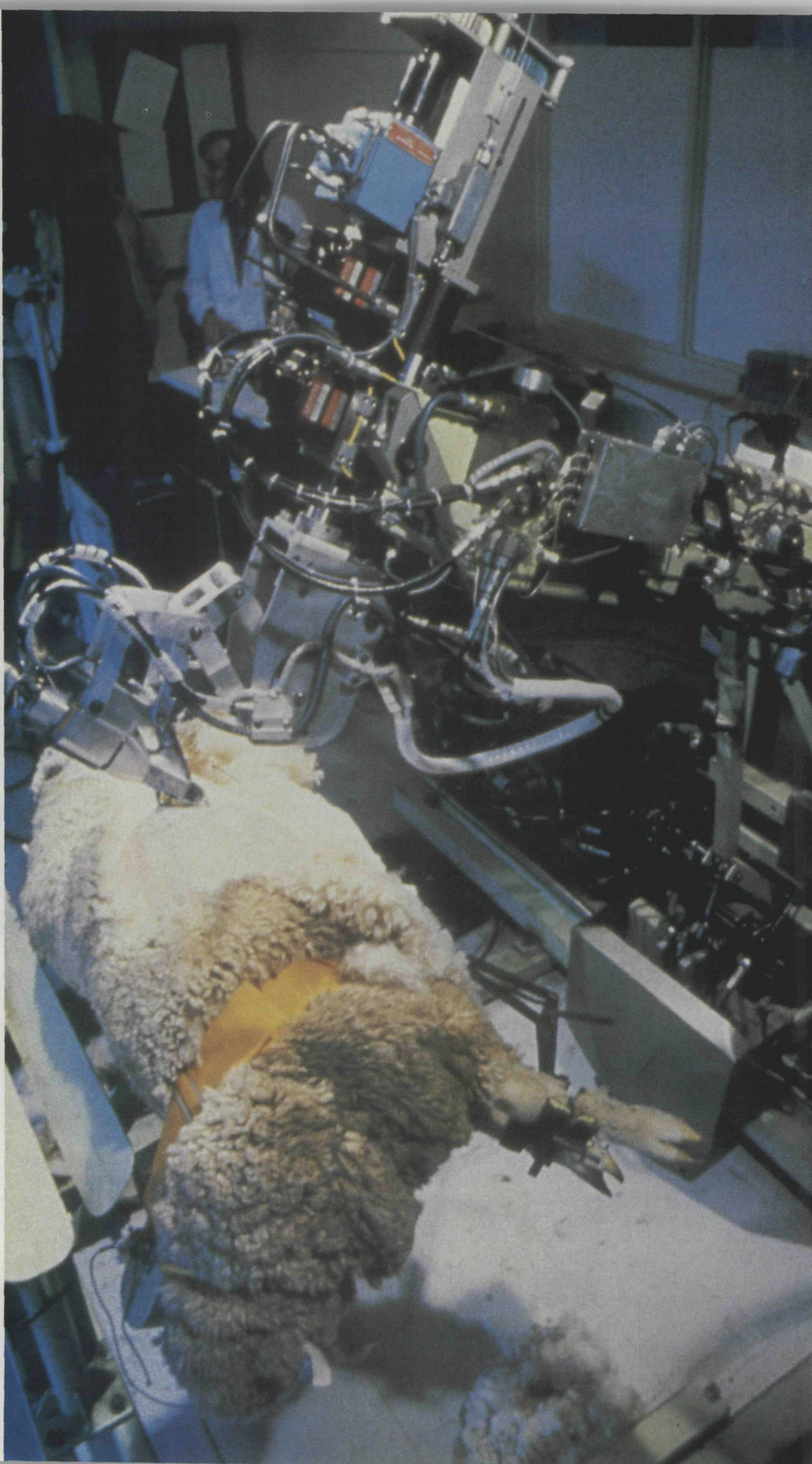
finally goes to work on farms, Bartholet says. And it will require dozens of research man-years and millions of dollars to develop a functionoid farmhand.

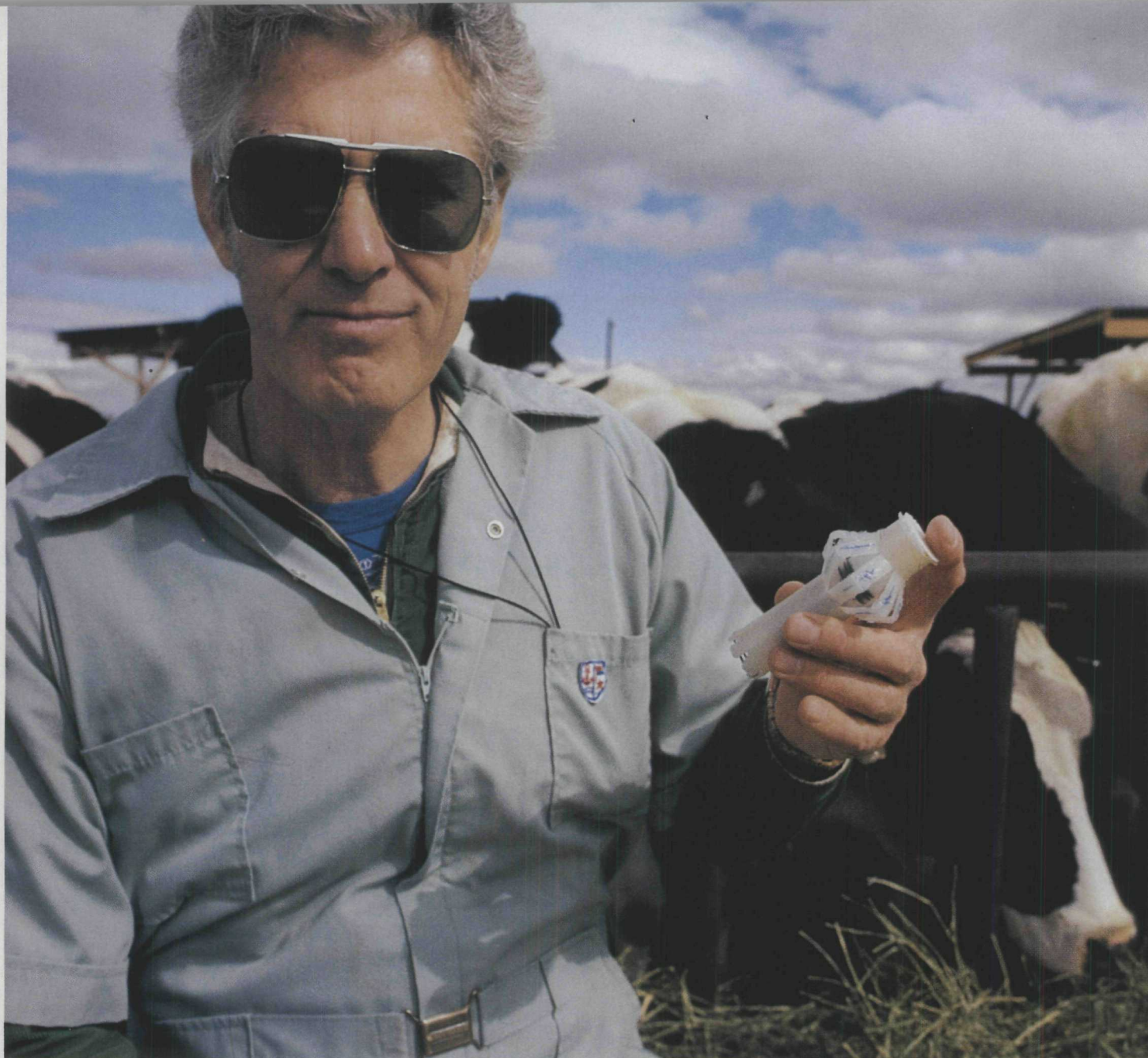
Public researchers are also working on some of the problems of advanced robotics. For example, University of Florida ag engineer Roy Harrell reports making progress on an artificial vision system for a citrus-picking robot. His prototype system uses a heavily filtered black-and-white camera to locate fruit. The system can tell the difference between this year's ripe oranges and similarly sized green oranges that must remain on the trees one more year to ripen. USDA recently funded a joint venture to assess the feasibility of combining the University of Florida and Odetics technologies for automated fruit harvesting.

German researcher D. Orloff is also working on a vision system that's based on computer interpretation of camera images. He uses infrared-sensitive scanners to detect a cow's teats, which are a different temperature than the rest of the udder. The vision system helps a robot attach a milking machine automatically.

Still other researchers are working to develop highly sensitive hand-like grippers. With improved grippers, robots would be less likely to injure the fruit they attempt to pick, says Lindsay Oliver, a scientist with Horizon Robotics in Saskatoon, Sask.

Mobile robots with better grippers would be a special benefit for those 2 percent of U.S. and Canadian farmers who are physically impaired, Oliver adds. He predicts that by 1990 these farmers will be





Farm robots/continued
using functionoids to grip and lift objects.

Electronic brains. Electronic devices that don't replace muscle work are another part of the farm-automation picture. So-called electronic brains already do a fair amount of scheduling and a degree of "thinking" to help farmers manage better, says Gary Krutz, a Purdue University ag engineer.

But he predicts even more sophistication in the future. For example, Krutz says grain growers may someday use electronic brains to help manage each acre individually. Krutz envisions a combine equipped with a computer and instruments to measure significant

yield variations within a field. Lasers or radar would help plot the combine's location as it gathers the crop.

Such a system could draw a map showing yield variations within a field. Krutz says a grower could next look at detailed soil maps and recent crop history, then devise a plan for varying fertilizer blends and application rates for every acre. That would allow the grower to make better use of fertilizer.

Talking tractors. Bill Stout, a Texas A&M University ag engineer, is working on a computerized prototype system that could someday give a human tractor operator verbal advice by means of a voice synthesizer.

For example, if the tractor's

diesel engine wasn't working hard enough to achieve maximum fuel efficiency, the computer might suggest a specific gear and engine-speed combination the operator could use to reduce fuel consumption by a certain percentage.

Kenny and Mark Lehman, who farm near Vernon, Texas, are helping Stout and Texas A&M engineer Harold Wiedemann gather baseline information for the project. Last year the Lehman brothers used a heavily-instrumented 2-wheel-drive tractor for a full season, including land preparation, planting, cultivation and wagon towing. An on-board computer recorded more than a dozen important tractor performance

David Zarlman invented a transponder that broadcasts a cow's identity and her temperature.

indicators, such as engine load and drive-wheel slippage.

Stout says he expects computer technology to get cheaper and cheaper. If so, a system such as the one Texas A&M scientists are working on might soon cost only a couple of hundred dollars. Stout figures this would make it economically feasible for farmers.

Electronic controllers are already helping some farmers. Allen Clevenger of Crook, Colo., for example, is using them to automatically open and shut a system of water-flow gates several times a day in a surge-flow irrigation system. Clevenger

Mark Lehman and his brother are helping scientists figure out how to make a tractor that can "talk."

says he can now apply water much more uniformly than with conventional furrow irrigation, and his yields are 20 percent higher. The automation also reduces labor requirements and cuts irrigation costs.

Remote-control farming. While one electronic brain is running your irrigation, will another drive your combine or tractor? Some experts see practical reasons why certain growers might use driverless tractors, while others won't. In a situation where permanent wheel-paths and wide-span equipment were used to reduce soil compaction, steering might be so simple that it could be automated. But with conventional farming methods, the cost of using remote-control systems could easily exceed that of an on-board human operator—even with high labor costs.

Various short-line companies are now marketing bolt-on kits that can make a tractor partially self-steering. The operator steers the first round. With one of these systems, the tractor then automatically follows a furrow made the previous round. Another type of unit feels crop rows to guide a tractor pulling a mounted cultivator. With either unit, the operator has to take over steering at row ends.

In addition, manufacturers are starting to offer devices that steer implements rather than tractors. One such unit can prevent "cultivator blight" on sidehills by steering a rear-mounted cultivator to keep it from plowing into the rows. Another guides the row-gathering unit on a forage harvester, allowing a tractor driver to stray almost two feet off the exact course.

Part-time self-guidance automation can react faster than a human, and with more pre-

cision. So self-guidance can sometimes make it possible to operate at higher speeds.

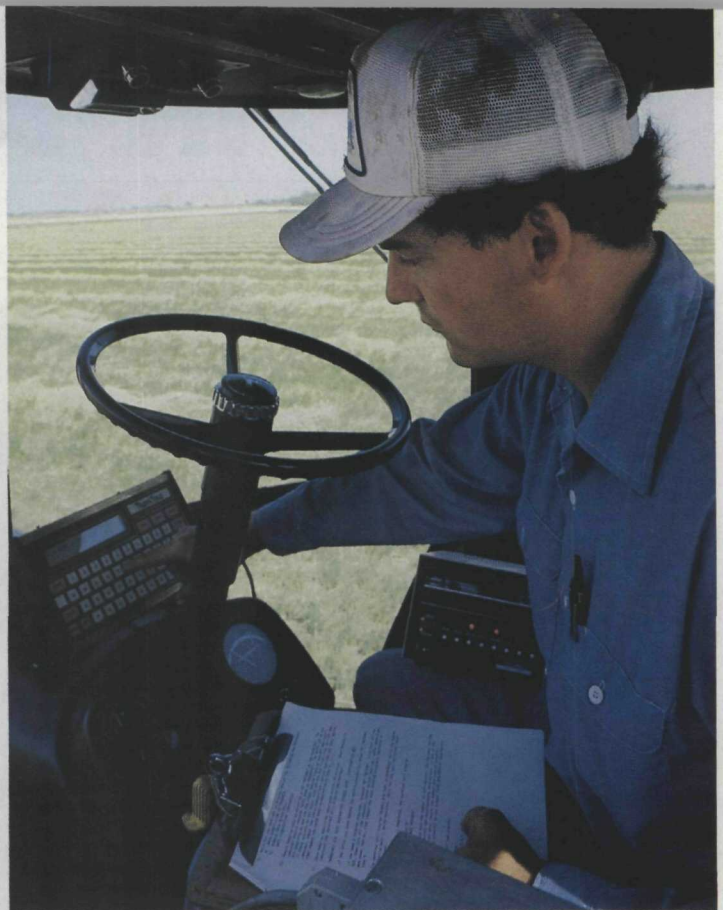
Cowputers. Dairy operations will probably be more automated than most other farms in the 1990s, predicts David Zartman, head of Ohio State University's dairy science department.

While doing research at New Mexico State University, Zartman helped develop electronic cow-identification and health-monitoring technology. He came up with a \$40-per-cow system based on transponders. A transponder goes into each cow's reproductive tract. It senses deep-body temperature and radios the temperature and the cow's identity code to a nearby computer. The computer lets the dairyman know if a cow has a fever, if she is ovulating or if she is about to deliver a calf.

Zartman predicts that an even more complete cow-management computer system will be available by 1990. In addition to monitoring reproduction and health, it would allow a dairyman to watch each cow's milk output, milking by milking. The computerized herdsman would also keep track of her feed intake.

Zartman says commercially available stand-alone systems can perform each of these tasks now. But the single system he envisions would do all three jobs at once. It also would consider each cow's health, stage of lactation and milk output, then decide when to limit her feed intake.

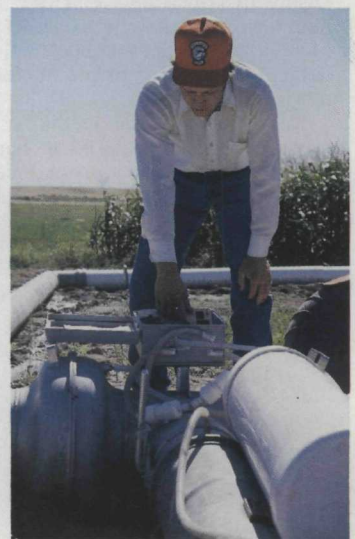
Exciting as all of this new technology is, it's important to remember that robots and electronic brains probably can't take over certain farming jobs. For example, Purdue University ag engineer Gaines E. Miles says robot technology may



This rear-axle torque sensor helps the "talking tractor" measure its horsepower and wheel slippage.

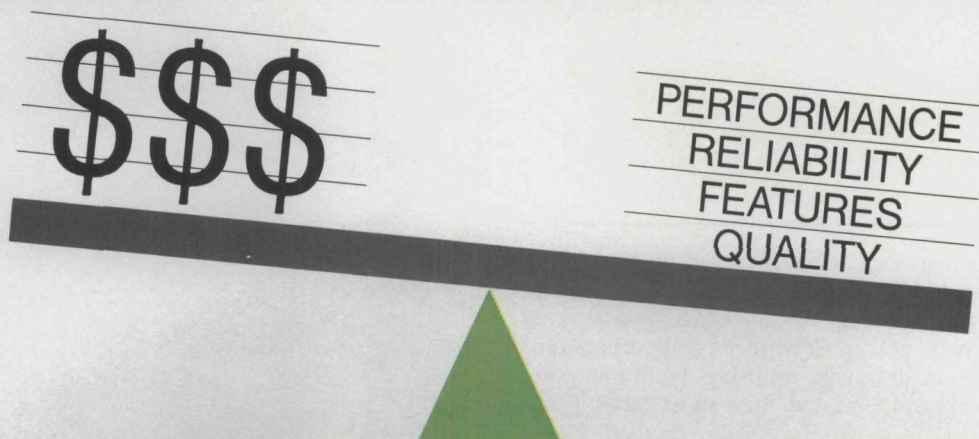
never replace a combine for harvesting corn.

Miles notes that a combine harvesting 3 acres per hour is handling roughly 25 ears per second. He figures that a robot arm and gripper in the far-off future might be able to harvest one ear per second. So you'd need a device with 25 arms to keep up with the combine. Even if a single robot arm cost only \$10,000 in today's dollars, a corn-picking robot would cost more than a quarter of a million dollars. The machine would also be enormously complex. So don't cut up your combine for scrap metal just yet.



Automation cycles water into furrows several times each day to give Allen Clevenger 20-percent-higher yields.

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John Deere Level-Action™ disks.
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don't offer. You reap the
benefits of performance others can't match

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matches. Here's what you get when you choose a John Deere Level-Action disk:

John Deere Double-Offset design. Front gangs overlap to cut away the center balk other disk designs leave behind.

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One-crank leveling. You can fine-tune front/rear leveling by turning one crank. No wrenches. No need to climb over the frame. Simply step up to the crank at the front of the disk.

Exclusive Dura-Flex® gang bearings on most models. Four

seals on these exclusive bearings hold in grease, block out grit. A 2-year parts and labor warranty backs these tough bearings.

Your John Deere dealer can fill you in on lots of other features that help make these disks a most economical buy. Features that add up to a first-class disk with the economy of many years of productive field performance. And with a price tag that's very competitive.

JOHN DEERE LEVEL-ACTION DISKS
ECONOMY FIRST CLASS



NO-TILL BOOSTS RETURNS FROM ROUGH LAND

Seeding grains and forages without tillage can make hill-country farming more profitable

In the mist-shrouded Allegheny Mountains of northern West Virginia and adjacent western Maryland, hundreds of farmers are taking to no-till technology.

No-till corn production came to the area first, according to Jim Stiles, Tucker County, W.Va., extension agent. And it has been followed by no-till seeding of small grains and forage crops.

"When I brought a no-till corn planter with me to Tucker County in 1974, it was the first one in the county," Stiles recalls. "My own father expressed the general skepticism about no-till planters. He said '...they may use 'em other places, but they'll never work up in these hills!'"

As it turned out, no-till planters worked quite well, and so did the no-till grain drills and PTO-powered pasture renovators used to establish small

grains, hay crops and improved pastures.

Now grades too steep to till aren't automatically relegated to permanent pasture. If soil texture, fertility and other factors are right, higher-value crops can be grown successfully by using no-till methods.

"Land that would have been a bit of bluegrass, a lot of headaches and no returns is now being seeded and is producing some profit for its owners," says Jim Simms, extension agent in Garrett County, Md. "Some farmers are netting \$180 an acre from their no-till alfalfa stands, a vast improvement over previous returns from those same acreages."

Area farmers who use the widely practiced corn-oats-hay rotation are reaping a number of benefits from no-till. The big one is erosion reduction.

"Without no-till, farmers have

been plowing slopes of up to 15 percent before planting corn," Stiles says. "Then they've plowed again before seeding oats and a hay crop. This results in too much exposure to erosion. Now they can spray hay ground and use a no-till planter to put in corn. Then they can use no-till to start their small-grain and hay crops. This way the soil is always covered."

In addition to saving soil, no-till also reduces fuel requirements and saves time, an especially important consideration given the large percentage of smaller, part-time farming operations in the area.

For the past two years, extension agents have conducted tours to acquaint more farmers with the techniques of no-till forage and small-grain seeding.

A barley-alfalfa stand and alfalfa seeded into oat stubble were two examples of no-till

included on last year's tour. In the barley-alfalfa stand, tour leaders pointed out, the barley prevented weeds from taking hold in the fall-seeded field. To eliminate competition with the alfalfa later on, the barley was harvested for silage early.

Farmers on the tour also saw the importance of timely administration of "knockdowns" such as paraquat to kill weeds before starting no-till stands. One field included on the tour was a chaos of shepherd's purse, chickweed and dandelion—the result of spraying five days later than recommended.

But despite the occasional problem, no-till is catching on fast in the Alleghenies. "More and more," says Jim Stiles, "it looks like the only way to go in this part of the country."

No-till alfalfa, seeded into old sod, thrives in a field high in the Allegheny Mountains.



Introducing a windrowing system



to satisfy the hungriest harvester



Form side-by-side windrows from two 9-foot swaths with a John Deere 1219 Mo/Co and new Double-Windrow Attachment

One reason you chose your forage harvester was for its capacity. For instance, John Deere Powr-Mizers with exclusive Dura-Drum™ cutter-heads can easily gobble up huge helpings of forage without lugging the tractor. But skimpy windrows leave these high-capacity harvesters running hungry for more.

The answer? Change your windrowing system. Outfit your John Deere 1219 or late-model 1209 Mo/Co with the new Double-Windrow Attachment. As you cut the crop, the Double-Windrow Attachment brings together two 9-ft. swaths. That's 18 ft. of fully conditioned hay in side-by-side doubled-up windrows up to 5 ft. wide. Doubled-up windrows that save trips through the field, cut harvesting time and costs, and satisfy your harvester's full chopping potential.

The Double-Windrow Attachment has easy-to-operate electrohydraulic controls mounted on the tractor. One rocker switch shifts the conveyor platform from side to side. Then the conveyor automatically changes direction to form the double windrow.

If you want a single, fast-drying windrow from your mower/conditioner, removing the Double-Windrow Attachment is a snap. Drop three stands, remove two pins and unhook the hydraulic hoses. No tools required.

Your John Deere dealer is the one to see for the Double-Windrow Attachment... and for productive forage harvesting machines. Stop by today.



The Double-Windrow Attachment cuts field time for high-capacity forage harvesters like the John Deere 3970.



**THE FORAGE
MASTERS**



Corn producers don't have to wait for new technology to turn out awesome yields. The inputs required to boost output and cut per-bushel production costs are available now.

The trick is to select those inputs and combine them in a complete and balanced production program, according to Roy Flannery, a Rutgers University soils specialist. Flannery produced the world record research corn yield of 338 bushels per acre. His average research-plot yield for the past five years is 307 bushels per acre.

"In our plots, we're using production practices that are available to farmers now," Flannery says. "But instead of looking at individual inputs, we're trying to put together a corn-production package that includes all the essential ingredients."

Flannery says irrigation is an essential component of a maximum-yield package in many areas. Regardless of the area, other important factors are hybrid, fertility and plant population.

PACKAGE PLANS FOR HIGHER CORN YIELDS

Scientists are searching for combinations of hybrid, population and fertility that produce consistently superior yields

Flannery plants non-irrigated plots at 32,000 and 37,000 plants per acre. Populations in irrigated plots range from 37,000 to 43,560 plants per acre. He's testing these populations in 21-inch rows as well as in more-equidistant spacings, including 12x14 and 12x12 inches.

Flannery's work documents the importance of hybrid selection. "In one test, one hybrid yielded 312 bushels per acre and another yielded 227 bushels, under identical growing conditions," he says.

Flannery uses up to 600 pounds of nitrogen, 300 pounds of P_2O_5 , and 450 pounds of K_2O per acre. He says split applications are a must with these rates. He plows down about a third of the NPK; the rest goes through a trickle irrigation system with up to 12 acre-inches of water. He also applies boron, copper, manganese and zinc.

A tank-mix of Bladex, Sutan, and atrazine controls weeds. For insects, he broadcasts 25 pounds of Furadan and 25 pounds of Dyfonate per acre. To control

Hybrids with such traits as disease resistance and prolificacy are one key to higher yields.

corn borers, he has applied an additional 10 pounds of Dyfonate per acre at the growth stage of 18 to 24 inches. "This was probably overkill, but hidden insect pressure depresses yields more than we realize," Flannery says.

The formula Flannery used to produce his top per-acre yield of 338 bushels—or 45 tons of silage—included a full-season hybrid, 43,560 plants per acre, 12x12-inch plant spacing, and his maximum fertilizer rates.

Flannery plans to continue his research this year on several co-operating farms. "This optimum combination of inputs has increased yields from corn research plots by about 100 bushels per acre," he says. "Now we want to see how much we need to scale them back for maximum economic yields."

Ray Lockman, manager of Agrico Chemical Company's agronomic services lab, has conducted extensive cost studies of several outstanding fertil-



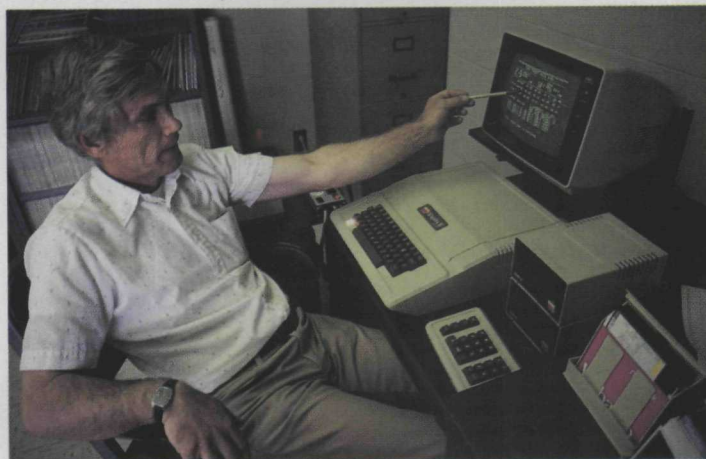
Roy Flannery produced 338 bushels of corn per acre with the right balance of inputs and production practices.

ity-management programs. He says they demonstrate the importance of including plenty of plant food in the production package.

Lockman provides this example: Over 16 years, corn club members in Fayette County, Ohio, spent about 38 percent more on fertilizer than the state average. But they also produced corn yields that were 50 percent higher than the state average—142 bushels per acre compared with 94 bushels.

Lockman notes that club members averaged \$144 per acre in net profit, compared with \$22 per acre in profit for the average corn grower in Ohio.

Lockman and a colleague, Butch Molloy, use a custom-written computer program to help evaluate fertility and other inputs. The program includes 100 production variables, from soil type to grower management. Lockman says nitrogen needs are still difficult to pinpoint. One formula he uses for



Butch Molloy uses a computer to help determine the best mix of inputs for top corn production.

higher yields is: yield goal in bushels $\times 1.5$ = total nitrogen need in pounds. To figure out how much to apply, you have to adjust this total to allow for nitrogen supplied by manure, soil organic matter, or a previous crop.

According to Lockman, setting a specific yield goal is a good way to begin a yield-increase program. "Aim for top yields in your locality," he says. "Or set

a goal of, say, 20 bushels per acre more per year for the next three years. That gives you—and your banker—some numbers to work with."

Mistakes in choosing hybrids can be especially costly when you're going for 200 bushels or more per acre, according to Jay Johnson, an Ohio State University agronomist. "In one of our maximum-yield studies, we reduced yields by 50 bushels per acre when we planted an upright-leaf hybrid in 40-inch rows," he explains. "Upright-

leaf hybrids require high-density stands to perform to their potential."

Johnson used plant populations of 35,000 to 45,000 per acre. He planted primarily in 20-inch rows. His top yield so far—246 bushels per acre—resulted from planting an upright-leaf hybrid in 20-inch rows at 40,000 plants per acre. He applied 400 pounds of N, 100 pounds of P and 200 pounds of K.

"Out of the 40 hybrids I've tested, about 30 didn't stand well in the high-yield environment," Johnson adds. "That's why we emphasize the importance of hybrid selection."

Frank Congleton, a University of Georgia agronomist, says you need to know how various hybrids respond to your soils, high nitrogen rates, and even irrigation if you plan to water. He adds that pest control is another basic requirement for good yields in his area. And for super yields, Congleton says, you have to put all these components together into a single prescription. The end result should be higher profits./John J. Reagan

Nutritious snack food

Roasted sunflower seed is probably a better buy than most consumers realize. Researchers say sunflower seed has more protein than almonds, walnuts and pecans. Only peanuts have more protein. Sunflower seed contains 31 percent more iron per pound than raisins and has relatively high levels of lysine, thiamine and niacin. In short, sunflower seed should rate high as a snack food because of its high-quality protein and unsaturated fat.

More leaves, higher yields

"In theory, the more leaves a corn hybrid has above the ear, the more that hybrid should yield," says John Dillon, research director for Renk Seed Company. "Those are the newest leaves on the plant and the ones which receive the most light and conduct the most photosynthesis."

According to Dillon, later-maturing hybrids nearly always have more leaves than earlier-maturing hybrids. That's because later hybrids grow longer and are generally larger in size. Dillon says the fact that later-maturity corn has two to four extra leaves helps explain its greater yield potential.

Sprout-resistant wheat

Cornell University researchers have come up with two lines of soft white wheat that are much less prone than current varieties to sprouting in the head. Plant breeder Mark Sorrells says it may be possible to have sprout-resistant varieties ready for growers within five years.

This is good news for growers in areas where late-season rains often cause sprouting in the head just before harvest. Losses from sprouted wheat can run as high as 50 percent. Sorrells says resistant varieties could cut losses in half.

Early bird catches the weeds

A recent University of Idaho study showed a 14-bushel yield advantage in winter wheat when herbicides were applied in the fall rather than spring. Weed scientist Donn Thill reports that early spring applications showed much the same advantage compared with treatments applied later in the spring.

Thill says these substantial yield differences emphasize that weeds are more susceptible to herbicides when they are small, and that it's best to eliminate weeds before they have a chance to compete for nutrients, water and sunlight.

Mushrooms mushroom

U.S. production of mushrooms hit a new high of 543 million pounds during the 1983-1984 marketing year. That was 11 percent more than the year before. Growers used more square feet of bed and tray area than they had previously, but average yield also was higher—3.93 pounds per square foot last year, compared with 3.63 the year before. Pennsylvania, with nearly 52 percent of the crop, was by far the leading mushroom state.

Beware of tame deer

In the wild, white-tailed deer pose no threat to human safety. Usually they go to great lengths to avoid people, as any hunter knows. But according to Larry Marchinton, a University of Georgia wildlife specialist, "tame" bucks can be quite dangerous. He says deer can be very domineering and aggressive in a confined environment.

When scientists place new animals together, their social order is challenged. The bucks battle each other to establish a new dominance ranking in the herd and to determine which will breed the does. So when someone walks into "king buck's" pen, the deer sees that person as a threat to his territory. Threatened bucks will snort, paw the ground, and often charge people.

Marchinton says the university's pet 16-point buck gored a researcher two years ago. And now his staff avoids pen entry as much as possible, especially during rutting season.

When Marchinton must enter a deer pen and one or more bucks are present, he brings along an escort and weapons to ward off a possible attack (see photo below). He warns that it's dangerous to underestimate the speed and power of a domestic deer, and its willingness to turn against territorial invaders. ▼

Additive makes swine leaner

An experimental feed additive, called a repartitioning agent, is demonstrating its ability to increase the ratio of muscle to fat in swine. In a University of Minnesota study, hogs fed the additive produced 10 to 15 percent more muscle mass and 10 to 15 percent less fat than untreated hogs. The additive increased loin eye areas but did not affect feed efficiency or rate of gain. It also had no effect on the soundness of hogs' feet or legs. Animal scientist Ron Moser says the additive would be especially useful for producers who sell hogs on a yield-and-grade basis.

Feeding for more milk

A study of 56 high-producing Holstein herds by Ontario dairy specialists shows that good feeding management does indeed pay off. Cows in these herds were better able to express their genetic potential for milk yield because of superior feeding management.

For example, cows in the most productive herds got higher levels of concentrate, more corn silage and slightly better forage. They also got closer feeding supervision in early and peak lactation. At those times, the high producers in the most productive herds received better forage and more grain, whereas there was a tendency toward feeding similar levels of grain to all cows in the lower-producing herds. By feeding to production, managers of the better herds made more efficient and economical use of grain mixes.





ALL BUSTED UP OVER BANANA-SHAPED BALES?

Relax. Get yourself a John Deere baler and end the banana-bale blues.

If your old baler has you singing the blues, then it's time to change your tune with the squarer baling action of a John Deere 347, 337 or 327 Square Baler. Their solid hay control system is the key.

It all begins with a wide pickup (156 teeth on 337 and 347 Balers) that promises few leftovers. Next, the adjustable hay compressor floats with the pickup, so you get

firm, consistent control—even over humps and dips. Then a floating, tapered cross auger sends a solid stream of hay flow-



ing smoothly to the precompression chamber. There, adjustable feeder forks fold your hay into the bale chamber instead of wadding it in. This folding action helps bales come out solid—time after time. And the gear-driven knottor gives them a sure, consistent tie.

Solid, squarer bales handle better, stay stacked for easier transport, and give you more hay per square foot. Get it all with a 347, 337 or 327 Square Baler. See your John Deere dealer soon.



**THE HAY
MASTERS**



The Money Management Alternative

*Leasing can get you the equipment you need
and conserve your cash flow*

If you're trying to increase productivity while you conserve cash, consider leasing. Leasing provides the lowest payments of any equipment financing plan. Plus, your trade-in can often cover the first-year lease payment. You get the use of the equipment you need while saving cash for feed, fertilizer or other inputs.

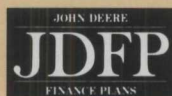
How can this be so? When you lease a machine, the investment tax credit and depreciation write-offs stay with John Deere. John Deere takes these tax credits and passes savings on to you in the form of lower payments.

So, if you cannot fully utilize investment tax credit, leasing is the smart money-management alternative. What's more, your lease payments are still deductible

Comparison of Leasing and Finance Note

Machine Cost:	\$60,000
Purchase Option:	15,000
Lease*	Retail Note*
	1 March 1985
12,125	Advance Payment/
12,125	Downpayment
12,125	1986
12,125	1987
12,125	1988
12,125	1989
15,000	1990
75,625	79,905

*Based on rates in effect in most states on 1 January 1985. See your John Deere dealer for current rates. All examples subject to approved credit.



**CONFIDENCE IN OUR EQUIPMENT
CONFIDENCE IN YOU**

as a business expense.

You can use leasing as a means of owning the equipment. You get a guaranteed purchase option on 5-year leases with a cost basis total of \$150,000 or less (per calendar year). Thus, you have the right to buy the leased equipment at the end of the lease term for a price set before you sign the lease.

A John Deere lease offers several payment schedules. Time the payments to expected income from the sale of crops or livestock.

Is leasing good business for you? Only you can decide. Look over the comparison of leasing and time payment and then talk to your lender, tax accountant and, of course, your John Deere dealer. This could be the year leasing makes good business sense for you.

LAND PRESERVERS

Wipe out weeds and handle heavy residue in reduced-tillage operations with John Deere's new 875 Min-Till Cultivator...

a key member of John Deere's full-season Conservation Tillage Team

Big, brawny and tough. That's the caliber of cultivator you need for top-notch crop care in minimum-till fields. **That's the new John Deere 875 Min-Till Cultivator.** Spring-loaded, heavy-duty field cultivator type C-shanks (3 per rig) provide excellent weed-killing action in tough minimum-tilled soils. Each shank features 10 inches of "trip" clearance, and 19 inches of trash-handling vertical clearance. Heavy residue flows through freely.

Manual bolt-adjust depth gauge wheels offer easy setting and consistent tillage down your rows. From headland to headland, the new 875 kills weeds in heavy-residue conditions with un-

New 875 Min-Till Cultivator

matched precision. **Massive 3 x 4-inch parallel rig-links** with heat treated, oil-impregnated bushings allow the rig members to follow the lay of your land while preventing side-sway. And big 2x4-inch rig-beams and 2x2-inch crossarms hold the shanks on line.

Get a new 875 Min-Till Cultivator to cover 4-wide-to 12-narrow-rows. Wipe out weeds and handle heavy residue in reduced tillage operations. Also, be sure to ask your John Deere dealer about other John Deere conservation tools, like the 7000 Max-Emerge® Conservation Planter, 722 Mulch Finisher and 712 Mulch Tiller.



7000 Max-Emerge® Conservation Planter



722 Mulch Finisher



712 Mulch Tiller



A TRUE CONSERVATION TILLAGE TEAM



NO TIME FOR ROCKING CHAIRS

*These farmers say retirement
is more rewarding if
you maintain your enthusiasm
and stay active*

By Rex Gogerty

An active retirement is a happy retirement. That may be oversimplifying things a bit, but it's a message that comes through clearly from farm men and women who are taking advantage of their retirement years to shift gears, achieve new goals and spend more time on their favorite interests.

Hans Anderson, who retired from a farm south of Rice Lake, Wis., is a good example. At 89, he still has an unflagging interest in his favorite crop, potatoes. But he maintains a brisk lifestyle that includes a variety of other pursuits, from entering tractor pulls to taking violin lessons.

Anderson's memories stretch back to days when pine stumps still lined Rice Lake's main street. He says he had little time then for activities off the farm. "My father was a firm believer in hard work," he adds. "They called him 'Potato King' Anderson. He taught me an awful lot about growing spuds and small grains."

In his adult years, Hans Anderson was an early cooperator

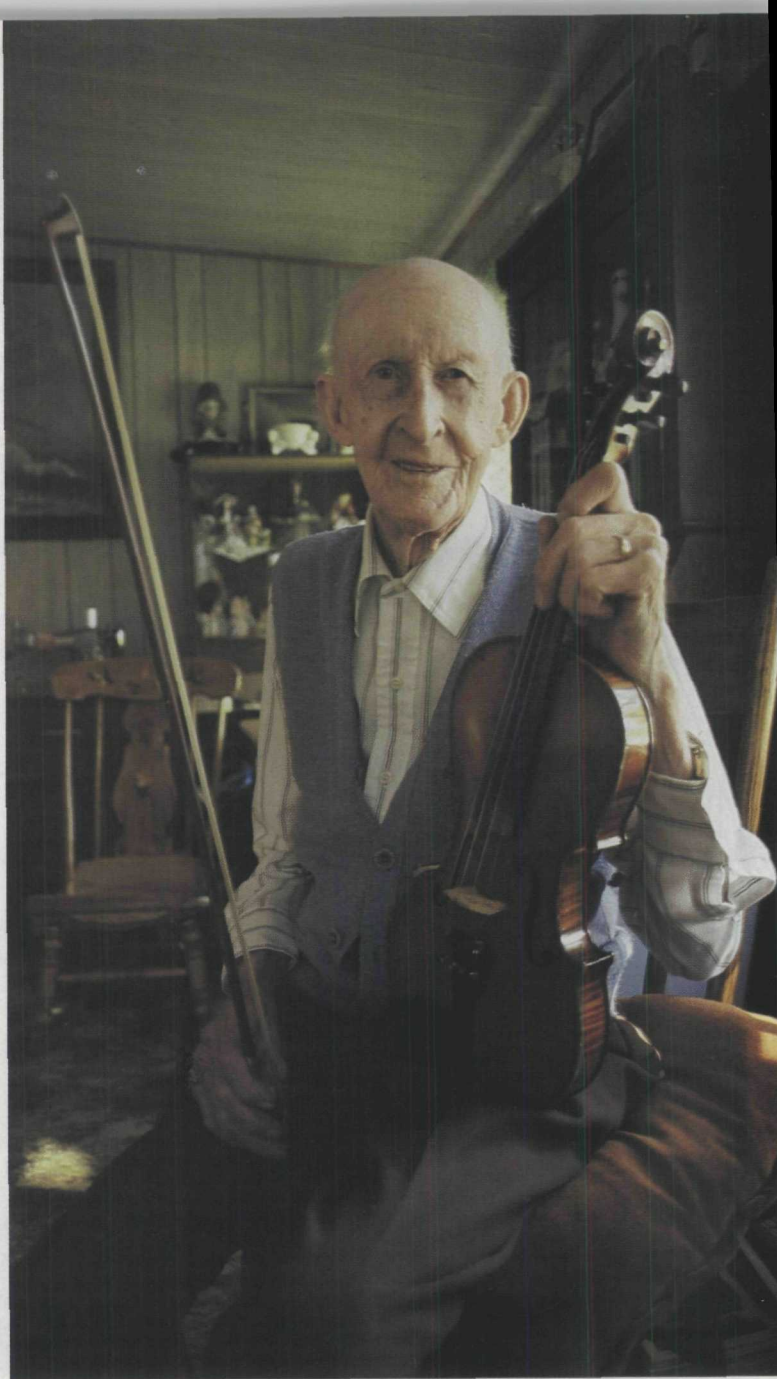
in University of Wisconsin potato research trials. He also helped develop a special sod plow, a powered potato digger and a cultivator.

Anderson bought his first tractor in 1929. "Charlie Bartlett, the machinery dealer at Cameron, got in a new John Deere GP, and it really caught my eye," he recalls. "It's what I call a 'nifty' tractor. I still drive it in the field once in a while, and every summer I enter an antique-tractor pull."

To keep posted on current agricultural technology, Anderson visits occasionally with county agent Don Drost and stops by the University of Wisconsin experiment farm at Spooner. He also reads a number of farm publications.

Anderson and his wife, Helen, allot some of their time to studying music. Hans is fulfilling a lifelong ambition by learning to play the violin. "I've been taking lessons for 10 years," he says. "I've always

Margaret and Bill Behrends sold most of their land but kept enough so they could continue raising cattle.





Fulfilling a lifelong ambition, Hans Anderson began taking violin lessons when he was 79 years old.

loved music." Helen takes piano lessons.

The Andersons share chores around the house and garden, which includes a sizable potato patch. "I guess I never will get tired of planting crops," Hans says. "And I still like to tinker with the old tractor and do a little collecting."

Ed Johnson of Zearing, Iowa, is another retired farmer who hasn't slowed down much. In fact, at 82, he's well established in a second career. "I do a lot of handyman jobs like hanging doors and patching roofs," Johnson says. "People are always looking for a repairman to take on little jobs."

Johnson is also a member of "Birthday Boys," a group of 20 retirees who head for a flapjack breakfast at a local restaurant whenever a member has a birthday. In addition, he and his wife, Lucille, have been bitten by the antique bug. His other interests range from walleye fishing to community events.

At 82, Ed Johnson enjoys taking part in threshing demonstrations and many other community events.

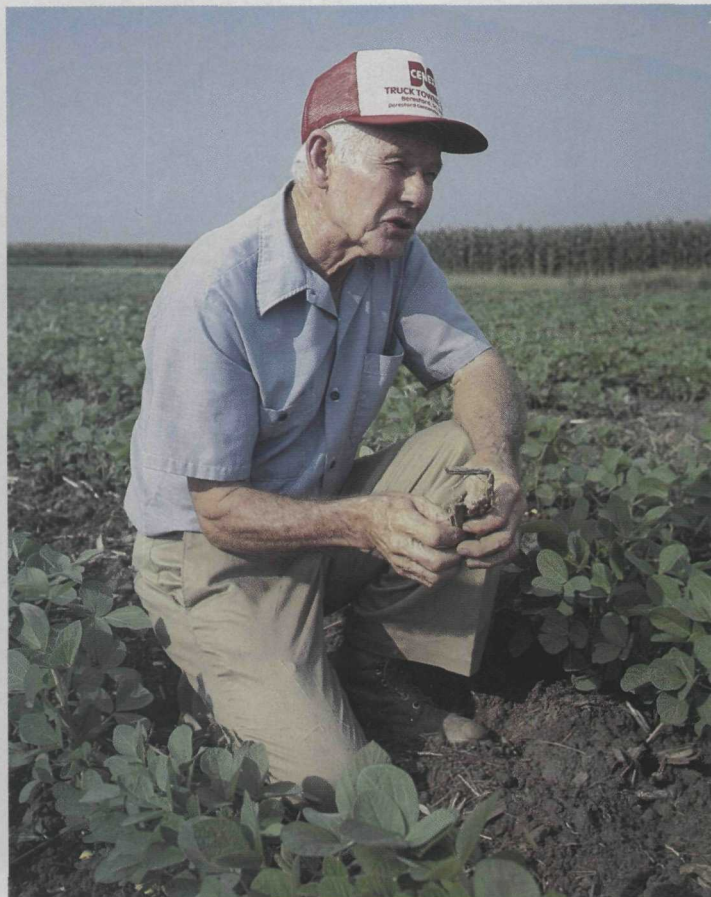
"There's nothing I like better than a horse show or threshing demonstration where young folks can see how we used to do things," Johnson says.

Bill and Margaret Behrends of Lamberton, Minn., have quit raising crops, but they still have a hand in farming. When they sold their farm to the University of Minnesota's Southwest Experiment Station, they kept their farmstead and a small acreage for cattle.

"We talked it over with the rest of the family and decided this whole arrangement was best for us and the farm," Bill says. "We've always been interested in the research they do at the station. Now we can still keep up with new technology and continue to raise registered Simmentals."

"I'll also have time to get serious about my hobbies," Behrends adds. "I collect coins, stamps and plates, and I do some wildlife photography."

Another veteran who hasn't



Since he retired from active farming, Ercil Bowles has been able to spend more time promoting minimum tillage.

retired from farming completely is Bob McCallum, a seed producer from Roland, Man. He started cutting back his farming operation 10 years ago, but he still produces 100 acres of seed crops a year.

McCallum, who is 74, says he and his wife, Hazel, can handle that acreage comfortably. "We're still doing something we really enjoy, but we're doing it at a much more leisurely pace than we used to," he adds.

Since his farming demands have slackened, McCallum has taken on a number of outside activities. For example, he has worked on a temporary basis for the Manitoba Crop Insurance Corporation and the Manitoba Seed Growers Association. He also has worked on various committees for his municipality.

"For me, cutting back to a minimum farming operation is working well," McCallum says. "Now my wife and I have about all the time we need for doing

other things we want to do."

Ercil Bowles, Centerville, S.D., says retirement has given him more time to hunt, fish and work with his vegetable garden and dwarf fruit trees. He and his wife, Berniece, continue their interests in church activities and conservation tillage. Bowles was a minimum-tillage pioneer in eastern South Dakota in the late 1960s. He continues to attend tillage meetings and field days.

"People chuckled at first when I planted in fields I'd been over with just a stalk cutter," Bowles recalls. "But when they found out I was cutting my fuel bill in half and getting the same yields, the practice caught on pretty fast."

Bowles, who is still spreading the minimum-tillage word at 75, says it's important for farmers to have a cause as well as a hobby when they retire.

Some retirees are volunteering at hospitals, joining the Peace Corps, and working with youth organizations. Ed Johnson sums up their philosophy this way: "We just like staying involved better than taking it easy."



What's the best buy you've made in farm machinery? In one poll, 97% said "My Max-Emerge® planter."

When the folks at Farm Show magazine* tabulated the answers from six years of asking that "best buy" question, "John Deere Max-Emerge planter" was by far the most popular answer. Ninety-seven percent of those who nominated their Max-Emerge planter volunteered that it was their best buy in farm machinery.

Why this popularity? In a word—reliability. Reliable accuracy. Maximum germination. Uniform emergence. Promises made by John Deere since day one of the Max-Emerge era. Promises proven by more than one million Max-Emerge planter row units.

You've seen proof in local fields. You've dug away soil behind the planter and proved to yourself how the Tru-Vee™ openers place seed at the preset depth.

You've seen how the V-pressure closing wheels create proper seed/soil contact—firming moist soil around the seed, yet leaving relatively loose soil directly above the seed.

You've taken windshield surveys and picked out Max-Emerge-planted fields—the uniform emergence is a giveaway. Other planters can make claims or proclaim "test" results, but only Max-Emerge planters have earned the trust of farmers a million times over. Only Max-Emerge planters earn a "best buy" vote from so many of their owners.

See your John Deere dealer for the model that can become your best buy—drawn or integral; rigid or flexible folding; sizes that reach 24 rows.



*Farm Show magazine, Lakeville, Minnesota

F U N & P H I L O S O P H Y

Errant

- Lady patient: "I need to get rid of a little wart."

Doctor: "Then you're in the wrong office. The divorce lawyer is across the hall."

- Ninety-nine percent of the failures come from people who have the habit of making excuses.

—George Washington Carver
(1864-1943)

Problem

- Visitor: "You're 80 years old and still doing a full day's work?"

Farmer: "Yes, but my Dad's sort of slowing down. Sometimes I wonder if farming really agrees with him."

- From a very early age, I had imbibed the opinion that it was every man's duty to leave his country as good as he had found it.

—William Cobbett
(1762-1835)

- Laws that do not embody public opinion can never be enforced.

—Elbert Hubbard
(1856-1915)

Logical

- Teacher: "Why did Robin Hood rob only the rich?"
Ichabod: "Because the poor didn't have any money."

- In matters of religion and matrimony I never give any advice, because I will not have anybody's torments in this world or the next laid to my charge.

—*Earl of Chesterfield*
(1694-1773)

- Tolerance is the virtue of the man without convictions.

—Gilbert Keith Chesterton
(1874-1936)

- Virtuous men do good by setting themselves as models before the public, but I do good by setting myself up as a warning.

—Michel de Montaigne
(1533-92)

- No human being can come into this world without increasing or diminishing the sum total of human happiness.

—Elihu Burritt
(1810-79)

Comforting

- He: "Honey, I hate to tell you, but I've just lost every cent of my money in the stock market." She: "That's awful, but don't worry, I'll still love you even if I never see you again."

- Give a man a fish and he eats for a day; teach him to fish and he eats for the rest of his life.

—Chinese proverb

- We are all tattooed in our cradles with the beliefs of our tribe.

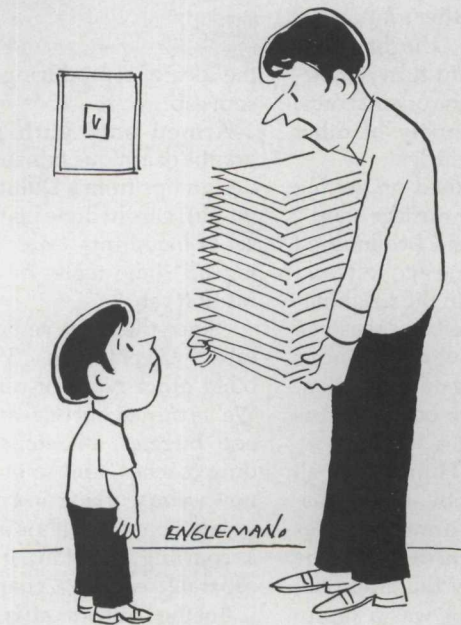
—*Oliver Wendell Holmes*
(1809-94)

Capsule sermons

- One way to save face is to keep the bottom half closed ... everybody has anatomy, but it looks better on girls ... you can say this for children: they don't go around showing pictures of their grandparents ... the man who smiles when something fizzles probably's thought of somebody to blame ... while there's life there's danger ... the emptier the pot, the quicker it boils ... an intelligent person is easy to identify—he thinks like you ... the trouble with medical insurance is you can't get it if you're sick ... the most foolish extravagance is a fancy funeral ... by the time you have money to burn, your fire may be out.



"Don't touch this one. It's sore."



"If you want to be a farmer when you grow up, practice filling out these forms."

COUNTRY CRAFTSMAN BUILDS HANDSOME HANSOMS

*Randy Utecht turns out replicas of hansom cabs
that sell for more than \$10,000 each*

By Harold Severson

Early in the last century, an English architect named Joseph A. Hansom designed a horse-drawn cab that came to bear his name. Hansom's cab was a light, 2-wheeled closed carriage given its distinctive look by an open, elevated driver's seat at the rear. A single seat over the axle had room for two passengers. They spoke to the driver through a trapdoor in the roof of the cab. By the end of the 1830s, the hansom was the most popular cab in London, and it also became a hit in New York and Boston.

Today hansom cabs are scarcer than John De Lorean's ill-fated gull-winged cars. But country craftsman Randy Utecht is staging a drive to bring hansom cabs back to the modern scene. Working out of a cavernous shop on his grandmother's farm near Kenyon, Minn., Utecht and a full-time assistant turn out elegant replicas of the original cabs, as well as a variety of other horse-drawn vehicles.

"I never planned on getting so busy with the carriage shop," Utecht says, "and I committed myself some time ago to working for farmers in the neighborhood during the busy seasons. I still plan to drive a combine or do some hauling now and then, but my primary occupation is building carriages."

Hobby first. However, it all started as a hobby. Long fascinated by horse-drawn vehicles of all types, Utecht decided some years ago to try building one. His first attempt was a reproduction of a Studebaker farm wagon. Later, after studying photographs and sketches of antique carriages, he hit upon



the idea of reproducing a hansom cab.

Armed only with photographs of antique hansom cabs and design tips from a Duluth shipwright, Utecht drew up his own set of blueprints. After gathering up some tools, he started his first cab.

"Since then, we've built five cabs," Utecht says. "We also build other types of carriages. We've turned out one- and two-seat buggies, phaetons, wedding coaches, and so on. Right now we're working on a mother-in-law's phaeton. It's also called a courting phaeton; it has a separate seat for a chaperon."

But the hansom cab is the finest example of his craftsmanship. Each one takes about two months to complete. Utecht buys the wheels from an Amish

Randy and Susan Utecht are all smiles as they check out a recently completed hansom cab.

wheelwright in Indiana. The lanterns and other brass fittings come from a Dutch firm. Utecht and his assistant manufacture the rest of the parts, including the springs and hinges.

The cab frame and body are made of Baltic birch, a strong, extremely durable wood imported from Russia. To form the wood into the correct shapes, it's steamed, bent and fastened to forms. "Getting the wooden pieces with compound bows to come out right is the most difficult part of building a cab," Utecht says. "It's also hard to get the whole cab balanced just right."

Utecht and his assistant work mostly with hand tools, some

of them specialized chisels, saws and other tools from another era. "There's so much hand fitting that power tools aren't of much use," Utecht says.

Some of the work can only be described as tedious. For example, Utecht's wife, Susan, applies fabric to each of the hundreds of buttons used to secure the plush velvet upholstery to the cab's interior. Susan also assists with installation of the upholstery itself.

Finishing touches give the cabs a smart appearance. After receiving six coats of primer, they're sprayed three times with Winchester green enamel.

Setback. Utecht's career as a carriage maker hasn't been without setbacks. In 1983, while in Indiana conferring with the Amish wheelwright, Utecht received a distressing telephone call from Susan. The shop he was then using had burned, destroying his equipment, his records, and several carriages.

Shortly after arriving home, Utecht received a package that he says reaffirmed his faith in human kindness. It was a gift of tools from his wheelwright friend. Utecht replaced the other equipment he needed, drew up new blueprints, and was soon back in business.

When he first began making carriages, he built most of them on speculation. Now most are built to order for carriage enthusiasts and collectors.

"The hansom cab appeals to the carriage fancier who is willing to pay for something distinctive, even unique," Utecht says. "My price for a cab isn't cheap, but as far as I'm concerned it's a bargain."



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(Hint: the one on the

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1. Front tires. If you look carefully, you'll note that the tractor on the right has 13.6-28 tires. The tractor on the left has 14.9-26 front tires. A small

difference, but a difference.

2. Front fenders. Now that we've mentioned it, it's obvious that only the tractor on the left is equipped with optional fenders.

3. Rear tires. The tractor on the right has 6-ply-rated rear tires, while the tractor on the left has 8-ply-rated tires. If you spotted that, you've got sharp eyes.

4. Rear axles. The tractor on the right is equipped with 96-inch axles. The tractor on the left has optional 119-inch axles. But both lengths are 92 mm in diameter.

5. Rear wheels. The tractor on the right is equipped with offset cast rear wheels. The tractor on the left is equipped



with heavy offset cast wheels. You can see the difference if you look closely.

Now look inside both Sound-Gard® bodies:

6. Dashboard. The tractor on the right is equipped with the standard gauge package and analog (dial) tachometer. The



BETWEEN THESE TRACTORS? right costs \$6,841 less)



tractor on the left is equipped with a complete operator information system. It includes our exclusive Investigator™ II warning system and digital readouts for engine speed, PTO speed, ground speed and time of day.

7. Transmission. The tractor on the right is equipped with our

exclusive 16-speed Quad-Range™ transmission. The tractor on the left is equipped with our exclusive 15-speed Power Shift transmission. Quad-Range is the standard transmission for 4050, 4250 and 4450 Tractors equipped with Caster/Action mechanical front-wheel drive. Fifteen-speed Power Shift is optional.

8. Seat suspension. Don't feel bad that you couldn't see this one...it's not visible in any of the photos. The tractor on the right is equipped with our standard seat suspension. The tractor on the left is equipped with exclusive HydraCushioned™ seat suspension. But both tractors are equipped with our famous Personal-Posture™ seat.

That's the sum total of differ-

ences, but the differences total \$6,841...a tidy sum. Which of these tractors is right for you? Well, that depends. See your John Deere dealer for details on the right way to order your new 100-hp 4050, 120-hp 4250 or 140-hp 4450.

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